A. Overview of Waiver

1. **Introduction**. The 1115 demonstration project for Maine, described in this application, is designed to overcome the current obstacles in the Medicaid Program that provides barriers to Maine residents in accessing drug therapies that are proven to prevent the progression of HIV disease and AIDS disease

2. **The Need for the Maine HIV/AIDS Waiver**. The drug therapies are very costly and most health insurers do not fully cover HIV/AIDS disease and its essential package of services, most notably antiretroviral drugs. Without financial assistance, people who require these drugs can not obtain the drug therapy treatment necessary for the control of this progressive disease. There is no debate that HIV/AIDS disease is progressive to the point of death in a relatively short time, usually less than ten years without treatment. Under current regulations an adult individual would not be eligible for Medicaid until they were found to be disabled under the Social Security Administration guidelines. This process leads to people becoming Medicaid eligible for short periods of time after their HIV disease deteriorates into AIDS disease, and after then after the prescribed treatments and medications improve their health their Medicaid eligibility is terminated. After a brief time, the client re-enters the Medicaid eligibility pool at a higher cost due to the discontinuation of the optimal drug therapy while ineligible for Medicaid. Most chronic illnesses when not treated in the optimal way would not result in an assurance of death, however, the critical problem when dealing with HIV disease is that when left untreated HIV disease progresses to AIDS disease and then to death. The only uncertainty is the time factor involved in completing the cycle.

3. **Eligibles Included in the Waiver**. All persons who have been diagnosed with HIV disease will be eligible for participation in the demonstration project when: (a) their gross family income is less than or equal to 300% of the federal poverty guidelines (FPL); (b) they have resided in Maine for at least 18 months; and (c) they agree to comply fully with the course of treatment prescribed by their assigned waiver program provider, including but not limited to viral load tests and Highly Active Antiretroviral Therapy (HAART). If a waiver participant becomes eligible for Medicaid, they would be disenrolled from the waiver program and continue treatment utilizing the medical benefits of the Medicaid Program.

4. **Circumscribed HIV/AIDS Waiver Benefits Package**. The waiver program will provide a circumscribed essential package of services that includes: (a) highly active anti-retroviral therapy (HAART); (b) other medications covered by Medicaid; (c) office visits; (d) laboratory tests for monitoring; (e) case management services; and (f) hospitalizations. This benefits package is designed to delay, prevent or even reverse the progress of this deadly disease, and be cost neutral or cost beneficial within five years.

5. **Premiums for Participation in HIV/AIDS Waiver**. The monthly premiums are on a sliding scale according to income and further adjusted as an individual progresses to a more advanced level of illness. The premiums are also adjusted each year for inflation so that proportionately the premium cost share remains constant with the increase of the costs of drugs due to inflation. The blended premium structure is shown in Appendix B, Tables 9 and 10.

6. **Regulatory Waivers Requested**. Maine has determined that the following six separate regulatory areas require waivers to implement this demonstration program:

   (a) income eligibility regulations in Section 1902 (a)(10)(A), to permit individuals with income up to 300% of the Federal poverty level to access services;

   (b) disability regulations located in Section 1614 of the Social Security Act, to permit those with HIV disease to access combination therapies so they will not progress to AIDS disease;

   (c) state=s resource limit regulations in Section 1613 and 1614 of the Social Security Act, to permit those with HIV/AIDS disease to access combination therapies regardless of resources and will not cause individuals to delay initiation of treatment due to fear of exhausting their resources;

   (d) amount, duration, and scope regulations located at Section 1902 (a)(10)(B) of the Social Security Act so that waiver recipients can access the smaller package of waiver services, thereby precluding the future use of the full range of Medicaid services;

   (e) freedom of choice regulations located in Section 1902(a)(23) of the Social Security Act, to restrict choice by limiting the provider pool to those providers that the Department deems acceptable for delivery of the waiver services;

   (f) residency regulations located in Section 1902 (b) of the Social Security Act, to impede residents of other states from moving to Maine to access services not available in their home state. Individuals who have not resided in the State for eighteen months will be prohibited from gaining eligibility to the waiver program. Maine expects to file an amendment to the waiver, that eliminates this restriction, after other states implement similar programs. This waiver allows the State the flexibility of moving individuals in the waiver program to Medicaid when eligible. Otherwise, the waiver would have to be limited to a fixed number of eligible individuals to preclude the migration of individuals from other states. This scenario makes movement between Medicaid and the waiver program administratively burdensome and less stable, which would create resistance from persons with HIV/AIDS disease in accessing the critical services necessary for

treatment of their disease.

B. Method of Design

A cost model has been developed that incorporates the disease states in estimating the cost of care for individuals in each state and the time individuals will spend in each state. The model utilizes two sets of parameters, one for those under the waiver program and the other for a similar group under the non-waiver program. The results show that the waiver program will be cost neutral within five years.

C. Cost Model

1. **Clinical Classification**. Patients were identified as HIV positive based on either a clinical diagnosis provided as part of a Medicaid claim or a pattern of use of anti-retroviral therapy over a period of at least several months. Cases of short-term use of antiretroviral agents were excluded because of the possibility of post-exposure drug prophylaxis.

Once identified as HIV positive, patients were stratified as having asymptomatic HIV infection (ASxHIV), symptomatic HIV infection (SxHIV), or AIDS based on diagnoses provided on claims and the pattern of clinical use of services and medications. In particular, ongoing treatment for apparent opportunistic infections was considered a marker for AIDS.

2. **Cost of Care**. The costs of care were developed using a traditional actuarial model for monthly costs of care. This model uses a grid stratifying care into various categories with a utilization assumption and a unit cost assumption for each category. Care was categorized into drugs and medical services. Drug costs were categorized as retroviral drugs, anti-infective drugs, and other drugs. Table 1 lists the 12 categories of service that were used in the model.

Routine Office Visits
Office Visits for Complications and side effects
Laboratory HIV Monitoring
Laboratory Other
Hospitalizations
Case Management/Social Work
Residential Care
Allied Health
Home Health
Miscellaneous
Nursing Home

Table 1 Categories of Service

The Maine Medicaid databases were used to:
Identify HIV infected patients,
Develop an HIV patient Medicaid client file including Medicaid coverage dates during 1996 and 1997

C. Identify all medical services and prescriptions provided to those clients during four semi-annual periods from January 1, 1996 through December 31, 1997.
C. Categorize drug and medical service claims using the above grid, and develop an average unit cost and monthly utilization for each category.

To develop the expected costs of the proposed Waiver program, unit costs were generally derived directly from the Medicaid database. Monthly utilization by Medicaid clients was reviewed and adjusted to allow for Abest practice@ medical care under a Waiver program. For example, actual utilization of anti-retroviral drugs among the HIV-infected Maine Medicaid clients is far from the ideal of all clients taking HAART therapy. Therefore, the utilization assumption for anti-retroviral drugs was adjusted to allow for 100% compliance with optimal drug therapy. Likewise, the cost and utilization assumptions for HIV viral monitoring were adjusted to allow for frequent monitoring of viral loads. In order to model a Anon-Waiver program@ alternative, both cost and utilization data was taken directly from averages developed from the Medicaid databases.

3. **Parameters For The Waiver and Non-waiver Programs**. Both the waiver and the non-waiver programs begin with an initial mythical cohort of 100 individuals. The original cohort are assumed to enter either program at various stages of the

illness. After close consultation with the primary care providers for people with HIV/AIDS disease in Maine, it was determined from their actual clinical cases the assumptions for the model initially is that 45% are ASxHIV, 35% are SxHIV and 20% have AIDS. In each program, based on separate transitional probabilities, some of the original cohort will transition to having SxHIV, or AIDS, and a few will die. The transitional probabilities are based on a Markov transitional probability model. The resulting transitional probabilities for the waiver and non-waiver programs are shown in Tables 2 and 3 respectively.

For the individuals in both programs, the model assumes, based on the same clinical studies cited above, that 10% of those who are ASxHIV and 50% of those who are SxHIV are Medicaid eligible. All individuals who contract AIDS will become Medicaid eligible.

The services for the waiver option include the following categories: drugs/medications, office visits, laboratory, case management/social services and hospitalizations. For cost purpose, these were combined into three cost categories: (1) anti-retroviral drugs; (2) non anti-retroviral drugs; and (3) service

The no waiver option lists all services currently covered by Medicaid: Drugs/Medications, Office Visits, Laboratory, Hospitalizations, Case Management/Social Service, Residential Care, Allied Health, Home Health, Miscellaneous, Nursing Home, and Psychological/Substance.

4. **Markov Transitional Probability Model**. The medical literature has focused on the Markov fundamental matrix model to estimate the average number of cycles an individual spends in a non-absorbing state before transitioning into the next state. In this model, the absorbing (final) state is death. Transitional probabilities are assigned to each state to establish the Markov model for the waiver (Table 2) and the non-waiver (Table 3). This model does not include reversions, because the probability of remaining in a current state is so high that the small probability of reversion would not significantly affect the results. The transitional probabilities that we use in our model are based on current literature and the clinical experience of physicians in Maine treating patients with the HIV disease.

		Waiver		
	Asx HIV	Sx HIV	AIDS	Death
Asx HIV	0.98	0.015	0.005	0
Sx HIV	0	0.98	0.015	0.005
AIDS	0	0	0.98	0.02
Death	0	0	0	1

Table 2. Markov Model for the Waiver.

	No Waiver		
Asx HIV	Sx HIV	AIDS	Death
0.85	0.11	0.04	0
0	0.91	0.08	0.01
0	0	0.98	0.02
0	0	0	1

Table 3. Markov Model for the Non-Waiver

Some of the literature has stratified the HIV disease into four states based upon $CD4^{+}$ cell count of: >500, 201-500, 51-200, #50 cells/mm^3 . Other sources used three states which we also used in our model. We have classified HIV into three states: Asymptomatic HIV (Asx HIV); Symptomatic HIV (Sx HIV); and AIDS. We have generally collapsed 51-200 and #50 cells/mm^3 into the AIDS category; 201-500 into Sx HIV; and >500 into Asx HIV. Our actual assignment of individuals was based upon a review of their medical status from the Medicaid claims data base.

5. Additional Parameters.

a. Probability Of HIV Patient Being On Medicaid

Probability of Asx HIV patient being on Medicaid	10%
C.Probability of Sx HIV patient being on Medicaid	50%
C.Probability of AIDS patient being on Medicaid	100%

b. Inflation Rates

Inflation rate of cost of Anti Retroviral Drugs (i_{ar})	3%
C.Inflation rate of cost of Other Drugs (i_{nar})	3%
C.Inflation rate of cost of Medical Services (i_{ser})	6%

c. Pharmaceutical Participation

Aids drug	18%
C.Other drugs	18%
C.Additional Anti-Retroviral Participation	13%

d. Third Party Liability (TPL)

Medicaid Population TPL_{NW}	1%
C.Non-Medicaid Waiver Population TPL_{W}	8.5%

e. Monthly Premiums

People with incomes 250 B 300% of FPL	$80
C.People with incomes 200 - 250% of FPL	$40
C.People with incomes 150 B 200% of FPL	$20
C.People with incomes < 150% of FPL	0

Monthly premiums are adjusted to take into consideration the fact that as an individual=s condition worsens, his or her ability to pay decreases. For those on the waiver, there is a different premium structure for each stage of the illness. Individuals who are on Medicaid do not pay a premium. The blended premium structure is shown in Tables 9 and 10 of Appendix B (Page B-4)

A detailed list of notations is given in Appendix A.

D. Data Sources

1. **Drug Claims**. Population drug claims data set for 1996 and 1997, where n=31390, were chosen based on the following variables: client, prescription date, drug description, and paid amount. This variable reflects 90% of charges.

2. **Service Claims**. The Service claims data set for 1996 and 1997, where n=25138, were chosen based on the following variables: client, service start date, category of service, paid amount and TCN.

3. **Category of Service**: There was a category of services (COS) mapping (Appendix C) whereby 65 Medicaid COS costs were calculated separately and then subsequently collapsed into broader categories classified as: Office Visits, Laboratory, Hospitalizations, Case Management/Social Service, Residential Care, Allied Health, Home Health, Miscellaneous, Nursing Home and Psychological/Substance. These individual cost categories were calculated and collapsed into one category called Services.

4. **Drug Codes**. The drug code types were classified into 5 categories: Anti-retrovirals, Anti- infectives, Psychological, Pain medications and Miscellaneous where n=247. The costs for the first category formed the Anti-retroviral category cost, and the costs for the last four formed the non anti-retroviral category cost.

All the data sets that include the drug claims data set, service claims data set, COS mapping data set, and drug code type data sets were collapsed into the Total costs by patient file.

E. Cost Calculations Method

In order to compare the cost of the waiver program to the non-waiver program, the costs are calculated separately for an original cohort of 100 who begin on the waiver program and for a separate group of 100 who are on the non-waiver program.

1. General Cost Components For Each Of The Levels Of The Illness.

a. Number of Individuals

C. The number of individuals (N_{ts}) from the original cohort who are at a particular time period and at a particular stage of the illness (based upon the Markov model).

b. Probabilities

C. The probability that an individual on the waiver will remain on the waiver (P_W) and the probability that a person on the waiver will go onto the non-waiver Medicaid program (P_{NW})

c. Costs

C. For those remaining on the waiver, the separate six-month costs include: the anti-retroviral drugs (CAR_W); non anti-retroviral drugs ($CNAR_W$); and services ($CSER_W$), each adjusted for inflation. These costs include all shared participation by the pharmaceutical companies, and the third party liability (TPL_W) for those on the Waiver program.

C. For those moving from the waiver to the Non-Waiver (Medicaid) program, the separate six-month costs include: the anti-retroviral drugs (CAR_{NW}); non anti-retroviral drugs ($CNAR_{NW}$); and services ($CSER_{NW}$), each adjusted for inflation. These costs include all shared participation by the pharmaceutical companies, and the third party liability (TPL_{NW}) for those transitioning to the Non-Waiver program.

	WAIVER NON-MEDICAID			WAIVER MEDICAID		
	ASxHIV	SxHIV		ASxHIV	SxHIV	AIDS
CAR_W	$	$ 698		$ 645	$ 756	$ 784
$CNAR_W$	$	$ 123		$ 87	$ 133	$ 421
$CSER_W$	$	$ 340		$ 499	$ 1,275	$ 1,360
	NON-WAIVER					
	ASxHIV	SxHIV	AIDS			
CAR_{NW}	$	$ 898	$ 932			
$CNAR_{NW}$	$	$ 133	$ 421			
$CSER_{NW}$	$ 499	$ 1,275	$ 1,360			

Table 4. Costs for Waiver and Non-Waiver Programs.

The cost difference between those on Medicaid under the waiver and those on Medicaid not on the waiver occurs because of the cost savings for anti-retroviral drugs under the waiver.

F. Premiums and Monthly Costs

1. **Pro-rated Premium (PRM_W)**. The pro-rated premium is paid by the individual on the waiver program. The premium is reduced as the stage of the illness worsens. Cost figures are based on actual Medicaid data for the years 1996 and 1997. Costs are calculated on six-month time periods. The five-year span of the calculations includes 10 time periods.

2. Monthly Costs Per Category (CPM).

a. Cost of Drugs Per Month

The cost per month is the cost per unit times the number of units per month. (CPU*UPM)

b. Cost Per Unit (CPU)

The cost per unit is the actual Medicaid cost of the unit. In the case of both anti-retroviral and non anti-retroviral drugs, the unit is usually a prescription. The cost per unit of medication is the cost of the unit before participation by the pharmaceutical companies.

c. Units Per Month (UMP)

In the case of both anti-retroviral and non anti-retroviral drugs, the unit is usually a prescription, and the number of units per month is determined by first finding the average drug dosage for the number of days prescribed by utilizing all of the Medicaid individuals involved and then converting this to a monthly figure.

d. Cost of Services Per Month

An average monthly cost by drug category was calculated as follows: Total of 6 month costs divided by the number of days of service = average daily cost (ADC). ADC*365/12=Average Monthly Cost per client for therapy by various classifications.

Detailed Cost Calculations for the model are shown in Appendix B

G. Analytical Results

1. The waiver program is cost beneficial to the Medicaid program

Total 5-year costs under the waiver program and under the non-waiver program show that the total cost under the waiver program is $10,157,131 while the total costs with the non-waiver program are $10,207,907. The cost difference is $50,776 less for the waiver program than for the non-waiver program.

The five-year total cost for each stage of the illness is calculated by finding the

cumulative cost over the five years. The cumulative costs for each stage are then added to find the total five-year cost.

TOTAL 5-YEAR	Waiver	Non-Waiver
ASxHIV	2,465,076	181,454
SxHIV	3,881,138	2,742,307
AIDS	3,810,917	7,315,827
TOTAL	10,157,131	10,207,907
Difference	(50,776)	Cost Beneficial

Table 5. Five-Year Cost Waiver Program and Non-Waiver Medicaid Program

The total 5-year costs utilizing six-month intervals are also illustrated in Figure 1. The waiver program is cost beneficial prior to interval 10.

Figure 1. The Total Five-Year Costs.

2. **Lower Mortality Rate.** The number of individuals who are alive and who do not have AIDS is dramatically greater with the waiver program. At the end of 5 years, under the waiver, of the original 40 who were ASxHIV, 37 still remained ASxHIV, while for the non-waiver cohort of 40 who were ASxHIV, only 9 still remained ASxHIV as can be seen in Table 6. Under the waiver, 34 would be SxHIV compared to 30 under the non-waiver. In addition, under the waiver, 23 would be living with AIDS, compared with 51 who would be living with AIDS under the non-waiver. Furthermore, under the waiver program, 6 individuals would have died from AIDS, while under the non-waiver option, 11 would have died.

TOTAL 5-YEAR	Waiver	Non-Waiver
ASxHIV		
SxHIV		
AIDS		
DEATHS	6	11

Table 6. Five Year Results: Waiver vs. Non- Waiver

The ten-year figures are even more dramatic. As can be seen in Table 7, of the original cohort of 100 individuals under the waiver, 30 are still Asx HIV, while only 2 individuals remain ASxHIV under the non-waiver program. For those on the waiver, 33 have Sx HIV, while on the non-waiver there are 15. In addition, with the waiver, 25 have AIDS compared to 59 under the non-waiver. And, at the end of 10 years, under the waiver, 12 have died, compared to 24 individuals who have died under the non-waiver.

TOTAL 10-YEAR	Waiver	Non-Waiver
ASxHIV		
SxHIV		
AIDS		
DEATHS	12	24

Table 7. Ten Year Results: Waiver vs. Non-Waiver

The comparisons of the ten-year death rates for the waiver and non-waiver programs are clearly illustrated in Figure 2.

Figure 2. Ten Year Results: Waiver vs. Non-Waiver

References

1. Beck JR, Pauker SG. The Markov Process in Medical Prognosis. *Medical Decision Making* 1983;3(4):419-58.
2. Moore, Richard D. and Chaisson, Richard E. Cost to Medicaid of Advancing Immunosuppression in an Urban HIV-Infected Patient Population in Maryland. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology* 1997;14:223-231 8 Lippincott-Raven Publishers, Philadelphia

APPENDIX A LIST OF ANNOTATIONS

2. **Notations**

Costs

CPM	Cost per month
CPU	Cost per unit
CAR_W	Cost of anti-retroviral drugs for those on the waiver
$CNAR_W$	Cost of non anti-retroviral drugs for those on the waiver
$CSER_W$	Cost of services for those on the waiver
CAR_{NW}	Cost of anti-retroviral drugs for those on the non-waiver program
$CNAR_{NW}$	Cost of non anti-retroviral drugs for those on the non-waiver program
$CSER_{NW}$	Cost of services for those on the non-waiver program

Inflation Percentages

i_{ar}	Percent of inflation for anti-retroviral drugs
i_{nar}	Percent of inflation for non anti-retroviral drugs
i_{ser}	Percent of inflation for services

Probabilities

$P_{W\text{-}s}$	Probability of being on the waiver program for a stage of the illness
$P_{NW\text{-}s}$	Probability of being on the non-waiver Medicaid program for a stage of the illness
$P_{W\text{-}ASx}$	Probability of being on the waiver and having asymptomatic HIV
$P_{W\text{-}Sx}$	Probability of being on the waiver and having symptomatic HIV
$P_{W\text{-}AIDS}$	Probability of being on the waiver and having AIDS
$P_{NW\text{-}Asx}$	Probability of being on the non-waiver and having asymptomatic HIV
$P_{NW\text{-}Sx}$	Probability of being on the non-waiver and having symptomatic HIV
$P_{NW\text{-}AIDS}$	Probability of being on the non-waiver and having AIDS

Other

ASxHIV	Asymptomatic HIV
SxHIV	Symptomatic HIV
UPM	Units per month
N_{ts}	Number at a given time period and stage
TPL_W	Third party liability for those on the waiver
TPL_{NW}	Third party liability for those on the non-waiver program
PRM_W	Premiums for those on the waiver program
COS	Category of service

APPENDIX B COST CALCULATIONS

Detailed calculations of determining costs for both the waiver and non-waiver programs is given in this appendix.

Note: The numbers used in the examples are rounded to the nearest whole value while, for purpose of calculation, the numbers in the spread sheet are not rounded. As a result, the calculated results in the examples do not exactly match the calculated results from the spread sheet. The results from the spread sheet were used as the final result in the examples.

Steps with Examples for calculating costs under the waiver program for individuals at a particular time period and stage of the illness.

Step 1 In calculating the waiver cost, the first step is to calculate the number of individuals from the original cohort who are at a particular stage of the illness based upon the transitional probability model (Table 2).

The number of individuals in the current six-month time period at a particular stage of the illness (N_{ts}) is calculated using the number of individuals from the previous time period in each of the illness multiplied by the transitional probability that they will move to the current level of the illness.

Example: We want to calculate the number of individuals at the Symptomatic HIV (SxHIV) stage of illness for the last six months of year five. This is time period 10. We look to the previous time period (period 9). As can be seen in Table 8, at time period 9, there are 38 individuals who are A-symptomatic HIV (ASxHIV) and 34 who are Symptomatic HIV (SxHIV).

		Waiver		
		Total Patients		
Period	Asx HIV Waiver	Sx HIV	AIDS	Dead Waiver
0	45	35	20	-
1	44	35	20	1
2	43	35	21	1
3	42	35	21	2
4	42	35	21	2
5	41	35	22	3
6	40	35	22	4
7	39	35	22	4
8	38	34	22	5
9	38	34	23	5
10	37	34	23	6

Table 8. Probability Distribution of Waiver Cohort.

Based on the Markov model, the probability that a person will transition from ASxHIV to SxHIV is 1.5% (.015). The probability that a person who is SxHIV will remain SxHIV is 98% (.98).

The number of people who are SxHIV at the 10^{th} period is:
38 * .015 + 34 * .98 = 34

Step 2 The second step is to determine the probability that individuals on the waiver will remain on the waiver (P_W) and the probability that individuals on the waiver will go onto the non-waiver Medicaid program (P_{NW}) for each level of the illness ($P_{W\text{-}ASx}$, $P_{W\text{-}Sx}$, $P_{W\text{-}AIDS}$, and $P_{NW\text{-}ASx}$, $P_{NW\text{-}Sx}$, $P_{NW\text{-}AIDS}$) These probabilities multiplied by the monthly cost of the level of illness, Steps 3 and 4, determine the basic monthly costs of the waiver program.

Example: For each time period, the model assumes that of the original cohort on the waiver, 10% of those who are ASxHIV, 50% who are SxHIV and all of those who contract AIDS will transition to the non-waiver Medicaid program. Based on these percentages, the resulting probabilities are: ($P_{W\text{-}ASx}$ = .90, $P_{W\text{-}Sx}$ =.50, $P_{W\text{-}AIDS}$ = 0, $P_{NW\text{-}ASx}$ = .10, $P_{NW\text{-}Sx}$ = .50, and $P_{NW\text{-}AIDS}$ = 1.0)

Step 3 The third step is to calculate the monthly waiver costs for each of the cost categories adjusted for inflation. [Anti-retroviral drugs (CAR_W), Non Anti-retroviral drugs ($CNAR_W$), and Services ($CSER_W$)]. For those on the waiver, these costs are determined by taking the average billed costs for each cost category and for each stage of the illness and then adjusting them for shared participation by the pharmaceutical companies and for third party liability coverage (TPL_W). These adjusted costs are the cost per month (CPM) for each category multiplied by 6.

Example: The cost in each category is found by multiplying the units per month (UPM) times the cost per unit (CPU), times the percent of cost after pharmaceutical participation, times the percent of cost after third party liability coverage. The formula is:

UPM * CPU * (% after pharmaceutical participation) * (% after TPL)

For example, for someone who is on the waiver with SxHIV, the actual figures used in the model for CAR_W are: 3.75 * 295 * 69% * 91.5% = 698. The costs for the other categories are determined in a similar manner, by first finding the separate costs for each component of the category and adding

these separate costs. The resulting monthly costs are:

Waiver: $CAR_W = \$698$ $CNAR_W = \$123$ $CSER_W = \$340$

Non-Waiver: $CAR_{NW} = \$898$ $CNAR_{NW} = \$133$ $CSER_{NW} = \$1275$

Step 4 Step 4 combines steps 1- 3 to determine the basic monthly cost of the waiver program for a particular period and stage of the illness. Step 1 is the number of individuals at a particular period and stage of illness (N_{ts}). Step 2 is the proportion of these individuals who will incur the separate costs associated with the formulas in Steps 3 and 4.

$$6* N_{ts} * P_{W\text{-}s}* [CAR_W * (1+ i_{ar}/2)^t + CNAR_W * (1+ i_{nar}/2)^t + CSER_W * (1+i_{ser}/2)^t + 6 * N_{NW\text{-}s} [CAR_{NW} * (1+i_{ar}/2)^t + CNAR_{NW} * (1+i_{nar}/2)^t + CSER_{NW} * (1+i_{ser}/2)^t]$$

Example: The example continues with determining the six-month cost for the time period (t = 10) for all individuals who began on the waiver program, are currently SxHIV, and who remain on the waiver program.

For each of the cost categories, the inflation rate is determined from historical Medicaid data and professional judgment. The inflation rates used are: Anti-retroviral drugs, 3%; non anti-retroviral drugs, 3%; and services, 6% compounded semi-annually.

$$6 * 34 * .50 *[698 * (1+.03/2)^{10} + 123 * (1+.03/2)^{10} + 340 * (1+.06/2)^{10} + 6* 34 * [.50 * 898 * (1+.03/2)^{10} + 133 * (1+.03/2)^{10} + 1275 * (1+.06/2)^{10}] = \$426,473$$

Step 5 The fifth step is to determine the amount of the blended premium which will be paid by the individuals on the waiver. The blended monthly premium is pro-rated based upon the level of income above the poverty level and the stage of illness that the individual is in . This blended monthly premium is adjusted for inflation by compounding at 5% annually. The model assumes an equal distribution of waiver individuals among the four income levels with 25% at each level.

Income as a Percent of Poverty	Percent Premium	Premium	Percent of Waiver Population ASx HIV	Blended Premium HIV Asx	Percent of Waiver Populatio n Sx HIV	Blended Premium Sx HIV	Percent of Waiver Populatio n AIDS	Blended Premium AIDS
<150%	0%	$ -	0.25	$ -	38%	$	50%	$ -
150-200%	25%	$ 20.00	0.25	$ 5.00	25%	$	25%	$ 5.00
200-250%	50%	$ 40.00	0.25	$ 10.00	20%	$	15%	$ 6.00
250-300%	100%	$ 80.00	0.25	$ 20.00	17%	$	10%	$ 8.00
Total Blended Premium				$ 35.00		$ 26.60		$ 19.00

Table 9. The number of individuals at each level, the premium paid by individuals at each income level and the blended premium for the first year

Period	Premium	Blended Premium Asx	Blended Premium Sx HIV	Blended Premium AIDS
0	80	$ 35.00	$ 26.60	$ 19.00
1	82	$ 35.88	$ 27.27	$ 19.48
2	84	$ 36.77	$ 27.95	$ 19.96
3	86	$ 37.69	$ 28.65	$ 20.46
4	88	$ 38.63	$ 29.36	$ 20.97
5	91	$ 39.60	$ 30.10	$ 21.50
6	93	$ 40.59	$ 30.85	$ 22.03
7	95	$ 41.60	$ 31.62	$ 22.59
8	97	$ 42.64	$ 32.41	$ 23.15
9	100	$ 43.71	$ 33.22	$ 23.73
10	102	$ 44.80	$ 34.05	$ 24.32

Table 10. Total Blended Monthly Premium Adjusted for Inflation

The savings for a particular period and stage of illness depends upon the number of individuals who are on the waiver program at that point and the blended monthly premium (PRM_W). The total number of individuals who are at this time period and stage is denoted by (N_{ts}) and was calculated in Step 1 and is shown in Table 8. The proportion of this group who remain on the waiver program for this time period and stage is determined by the transitional probability and is denoted in general by ($P_{W-(ts)}$). The formula for calculating the savings due to the premium is: $6*N_{ts} * P_{W-(ts)} * PRM_W$

Example: The total of the premiums that contribute to reducing the cost for individuals

who are on the waiver program with SxHIV at the 10^{th} time period is:

$6 * 34 * .5 * \$33.22 = \$3388$

Step 6 The final step is to put together the entire computation for one six-month time period and for one stage of the illness under the waiver. This step reduces the amount in Step 4 by the blended premium (PRM_W) which is paid by the individuals on the waiver program (Step 5)

$$6* N_{ts} * P_{W\text{-}s}* [CAR_W * (1+ i_{ar} /2)^t + CNAR_W * (1+ i_{nar} /2)^t + CSER_W * (1+i_{ser} /2)^t + 6 * N_{NW\text{-}s} [CAR_{NW} * (1+i_{ar} /2)^t + CNAR_{NW} * (1+i_{nar} /2)^t + CSER_{NW} * (1+i_{ser} /2)^t] - 6*N_{ts} * P_{W\text{-}(ts)} * PRM_W$$

Example: The six-month cost for the 13 individuals from the original waiver cohort who are SxHIV and who remain on the waiver program is:

$\$426{,}473 \text{ B } \$3388 = \$423{,}085$

This figure is calculated using the formulas in Steps 5 and 6.

$$6 * 34 * .50 *[689 * (1+.03/2)^{10} + 123 * (1+.03/2)^{10} + 340 * (1+.06/2)^{10} + 6* 34 * [.50 * 756 * (1+.03/2)^{10} + 133 * (1+.03/2)^{10} + 1275 * (1+.06/2)^{10}] - 6 * 34 * .5 * 33.22 = \$423{,}085$$

Cost Calculations for Those on the Non-Waiver (Medicaid) Program

In order to compare the costs of the waiver program to the non-waiver program, it was necessary to develop costs for the non-waiver program in a similar manner to those for the waiver program.

The model for the non-waiver Medicaid program begins with a cohort of 100 individuals, all of whom are ASxHIV and who will transition to the various stages of the illness based upon the Markov transitional probabilities.

The steps are similar for finding the costs for the non-waiver (Medicaid) program to those for finding the costs under the waiver. The exceptions are that: (a) all the individuals are on the non-waiver program all the time and (b) there is no premium for anyone on the non-waiver program.

The steps for determining the cost under the non-waiver Medicaid program are:

Step 1 The first step is to calculate the number of individuals from the original non-waiver cohort who are at a particular stage of the illness based on the Markov transitional model. This is done in the same way as in step 1 of the waiver program.

Example: Based on the Markov model (Table 3), the probability that a person will transition from ASxHIV to SxHIV is 11% (.11) and the probability that a person who is SxHIV will remain SxHIV is 91% (.91).

		No Waiver		
		Total Patients		
Period Year	Asx HIV No Waiver	Sx		Dead No Waiver
0	45	35	20	-
1	38	37		1
2	33	38		2
3	28	38		3
4	23	38		4
5	20	37		5
6	17	36		6
7	14	34		7
8	12	33		8
9	10	31		9
10	9	30		11

Table 11. The number of individuals who are ASxHIV and SxHIV under the non-waiver program.

The number of people who are SxHIV at the 10^{th} period is:
10 * .11 + 31 * .91 = 30

Note: The second step from the waiver program is not applicable to the non-waiver program because the second step determines the probability that a person on the waiver remains on the waiver.

Step 3: In calculating the non-waiver cost, the third step is to calculate the monthly costs for each of the cost categories adjusted for inflation in a manner similar to that done for step 3 of the waiver. [Anti-retroviral drugs (CAR_{NW}), Non Anti-retroviral drugs ($CNAR_{NW}$), and Services ($CSER_{NW}$)]. For those on the non-waiver, these costs are determined by taking the average billed cost for each cost category and for each stage of the illness and then adjusting them for the current shared participation by the pharmaceutical companies and for third party liability coverage (TPL_{NW}). These adjusted costs are the cost per month CPM for each category multiplied by 6.

Example: The non-waiver costs for each category are:

CAR_{NW} = \$898 $CNAR_{NW}$ = \$133 $CSER_{NW}$ = \$1275

Step 4 Step 4 combines steps 1- 3 to determine the basic monthly cost of the waiver program for a particular period and stage of the illness under the waiver program. Step 1 is the number of individuals at a particular period and stage of illness (N_{ts}), Step 2 is the proportion of these individuals who will incur the separate costs associated with the formulas in Steps 3 and 4.

$$6* N_{ts} * P_{NW\text{-}s}* [CAR_{NW} * (1+ i_{ar} /2)^t + CNAR_{NW} * (1+ i_{nar} /2)^t + CSER_{NW} * (1+i_{ser} /2)^t$$

Example: The example continues with determining the six-month cost for the time period t = 10 for all individuals who began on the non-waiver program, are currently SxHIV, and who remain on the non-waiver program.

The inflation rate is determined from historical Medicaid data and professional judgement for each of the cost categories. The inflation rates used are: Anti-retroviral drugs 3%, non anti-retroviral drugs 3%, and services 6% compounded semi-annually.

$$6 * 30 * .50 *[898 * (1+.03/2)^{10} + 133 * (1+.03/2)^{10} + 1275 * (1+.06/2)^{10}] = \$257,630$$

Under the non-waiver Medicaid program, there is no premium, thus, the formula in step 4 of the non waiver program reflects the six-month cost for a particular time period and a particular stage of the illness. In the example, it is the cost for the last six months of year five (time period 10) for individuals who are SxHIV.

Note: Under the waiver, step 5 is used to determine the premium to be paid and step 6 takes the value from step 4 and subtracts the premium. There is no premium under the non-waiver program.

APPENDIX C MEDICAID CATEGORIES OF SERVICE

The Medicaid categories of service (COS) were initially mapped into a set of twelve categories. The mapping is shown below in Table 12.

COS	Description	COS2
7	Podiatry	AlliedHealth
9	Dental	AlliedHealth
17	Prosthetics	AlliedHealth
27	Speech & Hearing	AlliedHealth
31	Physical Therapy	AlliedHealth
32	Chiropractic	AlliedHealth
33	Occupational Therapy	AlliedHealth
37	Optometry	AlliedHealth
42	Optical Services	AlliedHealth
45	Hearing Aid Dealers	AlliedHealth
46	Audiology	AlliedHealth
47	Speech Pathology	AlliedHealth
53	Nurse/Midwife	AlliedHealth
65	Non-traditional PHP	AlliedHealth
10	Drugs	Drugs
11	Home Hlth	HomeHlth
55	Attendant Services	HomeHlth
58	Private Duty Nursing	HomeHlth
59	Personal Care Services	HomeHlth
61	Rehabilitative Svcs	HomeHlth
1	General Inpt	Hosp
18	Ambulatory Surgery Center	Hosp
41	Medicare Crossover-A	Hosp
14	Lab & Xray	Lab
15	Transportation	Misc
16	Supplies & DME	Misc
29	Ambulance	Misc
51	Unclassified	Misc
52	HMO Waiver	Misc
3	Nursing Facility	NH
23	Swing Bed	NH
34	ICF/MR Svcs	NH
35	Day Habilitation	NH
36	Day Health	NH
4	General Outpt	Office
6	Physician	Office
8	PHP	Office
25	Family Planning	Office

30	Ambul Care Clinic	Office
43	Cert Rural Health Clinic	Office
44	VD Screening	Office
50	Medical Crossover-B	Office
54	Child Health	Office
60	Nurse Practitioner	Office
63	Early Intervention	Office
2	Psych Facility	Psych/Sub
19	Clozaril Monitoring	Psych/Sub
26	BMR Waiver	Psych/Sub
28	Mental Health	Psych/Sub
38	Psychology Svcs	Psych/Sub
48	Substance Abuse	Psych/Sub
62	Home-Based Mental Health	Psych/Sub
64	Develop/Behav Clinical Services	Psych/Sub
22	Phys Disabled Waiver	Residency
39	Private Nonmedical Inst	Residency
40	ICF/MR (Boarding)	Residency
49	Boarding Home	Residency
56	Waivered Boarding Home	Residency
5	Soc Svc	SocSvc
12	Community Support Svc	SocSvc
13	Social Worker Svc	SocSvc
24	Case Mgt	SocSvc
57	BME Waiver	

Table 12. Medicaid Categories of Service (COS) Mapping